

**ABSTRACT****Method and Wireless Systems using Multiple Antennas and Adaptive Control for Maximizing a Communication Parameter**

5 A method of maximizing a communication parameter, such as data capacity, signal quality or throughput of a channel between a transmit unit with M transmit antennas and a receive unit with N receive antennas and a communication system such as a wireless network (including networks with multiple access techniques such  
10 as TDMA, FDMA, CDMA, OFDMA) employing the method. The data is first processed to produce parallel spatial-multiplexed streams  $SM_i$ , where  $i=1\dots k$ , which are converted or mapped to transmit signals  $TS_p$ , where  $p=1\dots M$ , assigned for transmission from the M transmit antennas. Corresponding receive signals  $RS_j$ , where  
15  $j=1\dots N$ , are received by the N receive antennas of the receiver and used to assess a quality parameter, such as a statistical signal parameter including SINR, SNR, power level, level crossing rate, level crossing duration of the signal of a predetermined threshold and reception threshold, or a parameter  
20 of the data, such as BER or packet error rate. The quality parameter is used to adaptively adjust k as well as other parameters such as coding and mapping to transmit antennas such that the communication parameter of the channel is maximized.